

PR#9833

STORM, DAN

9/23/2008

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IN THE UNITED STATES DISTRICT COURT  
FOR THE NORTHERN DISTRICT OF OKLAHOMA

STATE OF OKLAHOMA, ex rel.  
W. A. DREW EDMONDSON, in his  
capacity as ATTORNEY GENERAL  
OF THE STATE OF OKLAHOMA and  
OKLAHOMA SECRETARY OF THE  
ENVIRONMENT C. MILES TOLBERT  
in his capacity as the TRUSTEE  
FOR NATURAL RESOURCES FOR  
THE STATE OF OKLAHOMA,

Plaintiffs

vs.

05-CV-0329 GKF SAJ

TYSON FOODS, INC., TYSON  
POULTRY, INC., TYSON CHICKEN,  
INC., COBB-VANTRESS, INC.,  
AVIAGEN, INC., CAL-MAINE FOODS,  
INC., CAL-MAINE FARMS, INC.,  
CARGILL, INC., CARGILL TURKEY  
PRODUCTION, LLC, GEORGE'S, INC.,  
GEORGE'S FARMS, INC., PETERSON  
FARMS, INC., SIMMONS FOODS, INC.,  
and WILLOW BROOK FOODS, INC.,

Defendants

VIDEOTAPED DEPOSITION OF DANIEL STORM  
Taken on Behalf of the Defendants  
On September 23, 2008, beginning at 9:16 a.m.  
In Oklahoma City, Oklahoma

APPEARANCES:

Appearing on behalf of the PLAINTIFF STATE OF  
OKLAHOMA

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Videographer: Stephen Carns

Reported By: Becky C. Dame, CSR, RPR

EXHIBIT

"F"

tabbles

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1 I'm trying to think. Those are the two  
2 primary ones.  
3 In addition, in the previous report, we  
4 did not separate out the contribution from the other  
5 nonpoint sources. So, in other words, we had a  
6 litter contribution to the total load, and all other  
7 nonpoint sources lumped together, and in this  
8 report, we're going to subdivide out those nonpoint  
9 sources components.

10 **Q Anything else?**

11 MR. ELROD: Thank you, Trevor. I  
12 appreciate it.

13 THE WITNESS: Also, we'll be doing --  
14 there's another model run to look at I think some  
15 projections into the future that we did not do in  
16 the previous report as well. So there's a number of  
17 runs that were not performed in the previous report  
18 that we are adding to this particular project.

19 BY MR. ELROD:

20 **Q All right. We're going to revisit all of  
21 this in a second, but let's take a time out now.**

22 **Trevor has been kind enough to obtain a  
23 complete copy of the Engel report.**

24 **If you would, please, answer the question  
25 whether his conclusions of land application**

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1 **contribution include STP or exist annually applied  
2 litter.**

3 A All right. So it looks like --

4 **Q What page are you on?**

5 A The table's on Page 55. All right. So  
6 the first part of that question is based on the  
7 errata, I believe it's 18 percent. But I believe  
8 he's attributing 18 percent to litter application,  
9 which would compare to my 15 percent.

10 **Q Okay.**

11 A And, then, let's look at the other part.  
12 Table 214, 215. So on Executive Summary, we're  
13 looking at Item No. 8 on Page 2, and I'm trying to  
14 find where those numbers correspond to the -- here  
15 we go. It would correspond to Page 92. See, that's  
16 Appendix D. It says, "The peak contribution of each  
17 significant source was determined using the higher W  
18 modeling, Appendix D."

19 Okay. So --

20 **Q What are you looking at now?**

21 A Yeah. Page 93. So if -- on his previous  
22 por -- the previous portion, we identified a --  
23 18 percent coming from litter application. This is  
24 stating either a 45 percent or 59 percent from --  
25 that would correspond to litter application and

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1 elevated STP.

2 **Q All right. So it's your belief that  
3 Dr. Engel's conclusion is that 45 to 59 percent of  
4 the total P loading at Lake Tenkiller includes both  
5 STP and annual litter application?**

6 A Yes, sir. Uh-huh.

7 **Q And what are your numbers --**

8 A Well, in this --

9 **Q -- for both?**

10 A -- in this report, we did not separate out  
11 the contribution from elevated STP.

12 **Q Are you intending to do that in the  
13 revised report?**

14 A Yes, sir.

15 **Q Why didn't your 2006 report attempt to  
16 quantify STP contribution?**

17 A Well, we weren't contracted to do it. The  
18 primary -- I mean, the way that the contract was set  
19 up, DEQ, if I remember correctly, they simply stated  
20 they wanted to know what reductions were going to be  
21 needed to meet the .03. The contract was not set up  
22 to proportion the existing loads out into those  
23 different components, and why they didn't have us do  
24 that, I don't know.

25 **Q Describe to me, please, the limitations**

40

1 **that you experienced in the 2006 report in regard to  
2 in-stream modeling?**

3 A What page was that? I believe there was a  
4 section specifically on that, correct? Here we go.

5 **Q What page?**

6 A Page 64 --

7 **Q Okay.**

8 A -- of the 2006 report.

9 **Q Okay. You're looking at the paragraph  
10 headed "in-stream Model Limitation"?**

11 A Yes, sir. Uh-huh.

12 **Q One of the things you say in here is that  
13 the in-stream model presented is experimental?**

14 A Correct. Uh-huh.

15 **Q Explain to me what you meant by that.**

16 A So, in other words, this was a model that  
17 we had developed for this particular project. All  
18 right. So, in other words, it has -- at this point,  
19 it hadn't been applied to basins other than the  
20 Illinois River.

21 **Q And would you tell the ladies and  
22 gentlemen of the jury, please, what "in-stream"  
23 means in this context?**

24 A Oh, okay. That would be the chemical,  
25 physical, and biological processes that are

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<p>1 I'll talk about that in a second.</p> <p>2 So a portion of those nutrients may enter</p> <p>3 the stream system via going through the soil profile</p> <p>4 versus running strictly off the soil surface. All</p> <p>5 right? And sometime -- well, those contributions</p> <p>6 typically would have a lag associated with them</p> <p>7 relative to the movement from the surface. So, in</p> <p>8 other words, it may take a longer period of time for</p> <p>9 them to actually reach the stream compared to</p> <p>10 surface runoff.</p> <p>11 Another phenomenon that occurs, or process</p> <p>12 that occurs, is when you have a stream system at</p> <p>13 baseflow conditions or low flow conditions, and then</p> <p>14 you have a runoff event, the flow in that stream or</p> <p>15 river is going to increase, and as it rises, some of</p> <p>16 that water can then move into the stream banks.</p> <p>17 And so the stream banks themselves provide</p> <p>18 what's called a transient storage dump. So it</p> <p>19 stores some of that water, and that water-containing</p> <p>20 pollutants. And then when the stage -- or the flow</p> <p>21 in the creek goes back down, then this water then</p> <p>22 slowly moves back into the stream and along with</p> <p>23 some of the nutrients that was carried with it</p> <p>24 during the storage portion.</p> <p>25 <b>Q Why did you not identify and analyze those</b></p> <p style="text-align: center;">70</p>	<p>1 <b>in the 2006 report?</b></p> <p>2 A That's correct.</p> <p>3 <b>Q From what sources?</b></p> <p>4 A These data would be from the Oklahoma</p> <p>5 Conservation Commission, the U.S. Geological Survey.</p> <p>6 I think those were the two primary sources. There</p> <p>7 may be a third one in there that I'm not recalling,</p> <p>8 but I think those -- those were the primary ones.</p> <p>9 <b>Q Why wasn't that day available to you in</b></p> <p>10 <b>the 2006 report?</b></p> <p>11 A Some of those data were. Again, it was</p> <p>12 simply an effort issue of time constraint in terms</p> <p>13 of, you know, where do you draw the line in terms of</p> <p>14 what to include and what not to include.</p> <p>15 <b>Q And if I wanted to go find the data that</b></p> <p>16 <b>you are now using at OCC and at USGS, where would I</b></p> <p>17 <b>look for it?</b></p> <p>18 A It's all publicly-available data.</p> <p>19 <b>Q What is it? It's data regarding what?</b></p> <p>20 A Oh, I'm sorry. It would be phosphorus</p> <p>21 samples that were collected at different watersheds</p> <p>22 throughout the Illinois River Basin.</p> <p>23 <b>Q By USGS?</b></p> <p>24 A By USGS or the Oklahoma Conservation</p> <p>25 Commission. And, again, there may be a third one in</p> <p style="text-align: center;">72</p>
<p>1 <b>issues in the 2006 report?</b></p> <p>2 A Well, simply just a time constraint.</p> <p>3 <b>Q Who suggested to you that you ought to</b></p> <p>4 <b>address those issues in the 2008 report -- or the</b></p> <p>5 <b>report you're working on right now?</b></p> <p>6 A I'm trying to remember exactly who I was</p> <p>7 talking -- how that came -- I believe those</p> <p>8 discussions were with the Oklahoma Department of</p> <p>9 Environmental Quality, and it related to some of the</p> <p>10 data that the Attorney General office collected on</p> <p>11 some of the baseflow samples from some of the</p> <p>12 watersheds.</p> <p>13 <b>Q So is it true, then, that you're going</b></p> <p>14 <b>to -- it's your intent to incorporate the Attorney</b></p> <p>15 <b>General's sampling program into your work product</b></p> <p>16 <b>this time around?</b></p> <p>17 A That's correct. We used -- we used some</p> <p>18 of the Attorney General data, but that was a</p> <p>19 relatively small amount. We spent some time and</p> <p>20 effort data mining and actually were able to include</p> <p>21 quite a bit more data than what the Attorney General</p> <p>22 collected -- office had collected. So that's</p> <p>23 actually a relatively small part of the total data</p> <p>24 set that we're using.</p> <p>25 <b>Q So you found new data that you didn't use</b></p> <p style="text-align: center;">71</p>	<p>1 there, too, as well as we included, of course, the</p> <p>2 data collected from the Attorney General's office,</p> <p>3 too.</p> <p>4 <b>Q So we're talking about phosphorus</b></p> <p>5 <b>sampling?</b></p> <p>6 A Yes. Uh-huh.</p> <p>7 <b>Q Springs that weren't available to you</b></p> <p>8 <b>before?</b></p> <p>9 A I'm sorry.</p> <p>10 <b>Q Springs, S-p-r-i-n-g-s?</b></p> <p>11 A I don't believe -- we didn't include any</p> <p>12 spring data. This was all stream -- stream flow</p> <p>13 data that we're utilizing.</p> <p>14 <b>Q Have you ever attempted to -- strike that.</b></p> <p>15 <b>You also testified that you were this time</b></p> <p>16 <b>around going to look -- you were going to break out</b></p> <p>17 <b>nonpoint source contributions?</b></p> <p>18 A Yes, sir.</p> <p>19 <b>Q How are you doing that?</b></p> <p>20 A It would be through -- running the model</p> <p>21 through a series of different scenarios. So, for</p> <p>22 example, if you're wanting to estimate the</p> <p>23 contribution from litter application, you take your</p> <p>24 calibrated and validated model, you remove the</p> <p>25 litter application from the model itself, and then</p> <p style="text-align: center;">73</p>

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1 run the model, compare that altered model to your  
2 calibrated model, and the difference you would  
3 attribute primarily to litter application.  
4 **Q What other nonpoint sources are you going**  
5 **to break out?**  
6 A So we will attempt to break out the effect  
7 of grazing as well as the contribution from elevated  
8 soil test phosphorus. I think those are the three  
9 primary ones. Grazing, litter -- yeah. I think  
10 those are the three primary ones.  
11 **Q Septic?**  
12 A We're neglecting septic contributions.  
13 **Q Why?**  
14 A Relatively minor contribution compared to  
15 other sources.  
16 **Q Who says so?**  
17 A Well, based upon looking at population  
18 numbers and number of septic tanks and things of  
19 that sort.  
20 **Q That's a judgment call on your part?**  
21 A Absolutely.  
22 **Q Dirt roads?**  
23 A Those would not be included in our  
24 modeling exercise.  
25 **Q Why?**

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1 A Partly due to -- well, primarily due to  
2 the level of detail needed to accurately reflect  
3 those contributions.  
4 **Q Tell me what you just said.**  
5 A The amount of detail that you would need  
6 in terms of data and descriptions and modeling to  
7 accurately identify the contributions from those  
8 roads. I mean, if it was easy to incorporate into  
9 the SWAT model, we would account for it.  
10 **Q You would agree with me that dirt roads do**  
11 **make a substantial contribution to turbidity in the**  
12 **waters; correct?**  
13 A I don't have a number for how much they  
14 contribute. Obviously, my personal opinion, they  
15 contribute to that turbidity, but the issue is how  
16 much, and I just don't know the contribution.  
17 **Q And you also would agree with me that**  
18 **normally -- is it your position that in the IRW**  
19 **turbidity equals increased phosphorus loading?**  
20 A Well, you have two components to  
21 turbidity. One would be the biotic component and  
22 then the other would be the abiotic. All right. So  
23 sediment would contribute on the abiotic end, and  
24 then on the biotic end, you'd have algae, for  
25 example.

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1 **Q Let's talk about the abiotic for a second.**  
2  
3 A Okay.  
4 **Q Is it not true that SWAT model assumes**  
5 **that increased abiotic turbidity equals an increase**  
6 **in phosphorus loading?**  
7 A So you have sediment-bound phosphorus --  
8 **Q Right.**  
9 A -- that is produced from the upland areas  
10 that is then transmitted to your stream system, so  
11 that's correct.  
12 **Q And you've spent a lot of time in the IRW,**  
13 **haven't you?**  
14 A Quite a bit, yeah.  
15 **Q And you know it's laced with dirt roads?**  
16 A Sure.  
17 **Q And there's a lot of erosion from those**  
18 **dirt roads, isn't there?**  
19 A I don't know the magnitude. You know, a  
20 lot of those dirt roads are with that cherty soil,  
21 so they're relatively stable compared to, say, dirt  
22 roads in the central part of the state. So, really,  
23 it's an issue of how much they contribute, and -- I  
24 don't know -- I don't think I would be comfortable  
25 saying that it's a significant amount without

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1 looking at it in much more detail.  
2 **Q Okay. But it is -- there is a contributed**  
3 **amount of some -- there is -- of some amount; right?**  
4 A Absolutely. Sure.  
5 **Q But the SWAT model does not take that into**  
6 **account?**  
7 A Not directly. Again, due to the level of  
8 detail that would be required.  
9 **Q The -- you do take into account farm**  
10 **ponds?**  
11 A Yes. Uh-huh.  
12 **Q And Bernie Engel does not take into**  
13 **account farm ponds, does he?**  
14 A I don't recall seeing anything in farm  
15 ponds in his report.  
16 **Q And let's talk about farm ponds for a**  
17 **second.**  
18 A Uh-huh.  
19 **Q Given the nature of agriculture in the**  
20 **IRW, most stock is watered from farm ponds; correct?**  
21 A Well, quite a bit of the livestock is.  
22 **Q And -- I mean, this is so -- let me just**  
23 **ask it to you for the record.**  
24 **Most of the cattle agricultural practice**  
25 **in the watershed is cow/calf operations; correct?**

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<p>1 that to be true and assuming all of that is actually</p> <p>2 land applied in the watershed and assuming you've</p> <p>3 got 450,000 acres of land on which to distribute</p> <p>4 that 212,000 tons, that would only be about a half</p> <p>5 ton per acre; correct?</p> <p>6 MR. NANCE: Object to the form.</p> <p>7 BY MR. ELROD:</p> <p>8 Q That's -- my math -- I mean, that's</p> <p>9 correct, isn't it?</p> <p>10 A Assuming that your math is correct, it is.</p> <p>11 Q Okay. Now, at a half ton per acre rate in</p> <p>12 the world of fertilization with chicken litter is a</p> <p>13 small rate, isn't it?</p> <p>14 A Correct.</p> <p>15 Q So don't we really -- if there's an issue</p> <p>16 in the Illinois River watershed, won't you agree</p> <p>17 with me that it may be a distribution issue rather</p> <p>18 than a necessity of exporting litter?</p> <p>19 A It's kind of a combination of both in one</p> <p>20 sense, because you have -- you have -- the litter is</p> <p>21 a source of nutrients for -- in this case, a</p> <p>22 foragery or grassland. And when you surface apply a</p> <p>23 por -- and, you know, you get runoff, you get a</p> <p>24 portion of that litter that moves into your surface</p> <p>25 runoff and into your receiving water bodies.</p> <p style="text-align: center;">106</p>	<p>1 let's see. What would be a good example here?</p> <p>2 Say you had ten tons of litter and you put</p> <p>3 down ten tons of litter on a ten-acre field, and you</p> <p>4 had two fields that were identical to that, and then</p> <p>5 instead of putting it all down on one ten-acre</p> <p>6 field, you spread it out on two ten-acre fields,</p> <p>7 right, but at half the rate, you would receive --</p> <p>8 approximately you would get about the same amount of</p> <p>9 phosphorus leaving the field.</p> <p>10 Q Who are you relying on for that?</p> <p>11 A That was based on some plot studies that</p> <p>12 we did when we looked at various rates.</p> <p>13 Q "We" being?</p> <p>14 A Oklahoma State University.</p> <p>15 Q Were you involved in those studies?</p> <p>16 A Yes.</p> <p>17 Q And how long ago were they done?</p> <p>18 A Oh, these were -- these were done back in</p> <p>19 the '90s.</p> <p>20 Q So I would be able to find them?</p> <p>21 A Yes. And, if not, you can let me know,</p> <p>22 and I can get you copies of those.</p> <p>23 Q And who were your cohorts?</p> <p>24 A Oh, these would be Dr. Michael Smolen,</p> <p>25 Dr. Ray Huhnke, Dr. Glenn Brown. I think those</p> <p style="text-align: center;">108</p>
<p>1 But it's also an issue relative to the</p> <p>2 buildup of the phosphorus in the soil, and it turns</p> <p>3 out that the higher the level of phosphorus in the</p> <p>4 soil, the more phosphorus moves into the runoff into</p> <p>5 the receiving water bodies.</p> <p>6 And so you have an issue of both litter as</p> <p>7 a source and then elevated soil phosphorus levels as</p> <p>8 a source.</p> <p>9 Q But here's my question to you, though:</p> <p>10 Have you performed any calculations that would show</p> <p>11 whether distributing evenly 212,000 tons of chicken</p> <p>12 litter at a half ton per acre would -- all of the</p> <p>13 phosphorus from that distribution would be uptaken</p> <p>14 by fescue and Bermudagrass?</p> <p>15 A Some of the -- you know, the various plot</p> <p>16 studies and all that we've conducted, as well as</p> <p>17 other people, I mean, it's -- whether you distribute</p> <p>18 the litter uniformly over small amounts -- well, if</p> <p>19 you distribute it in small amounts over large areas</p> <p>20 or high amounts over small areas, the relative</p> <p>21 proportion of what's leaving or loss of phosphorus,</p> <p>22 assuming everything else is constant, is about the</p> <p>23 same.</p> <p>24 So, in other words, if you had a field --</p> <p>25 two fields -- two identical fields, and each of --</p> <p style="text-align: center;">107</p>	<p>1 would be the primary ones.</p> <p>2 Q Now, these were small plot studies with</p> <p>3 simulated rainfall events?</p> <p>4 A Yes, sir.</p> <p>5 Q Now, would you agree with me that -- from</p> <p>6 a modeling standpoint, that when you move from the</p> <p>7 small plot simulated rainfall events to a 40-acre</p> <p>8 real world pasture situation to a 450,000 plus or</p> <p>9 minus pastures in a million-acre watershed situation</p> <p>10 like the IRW, that the small test plot results can</p> <p>11 become fuzzier and fuzzier and fuzzier in terms of</p> <p>12 usefulness?</p> <p>13 A That would be one way of phrasing it, yes.</p> <p>14 The issue is, when you go from a small plot to a</p> <p>15 field and then to a watershed scale, there's some</p> <p>16 other processes between the end of the plot to the</p> <p>17 edge of the field to the receiving water body.</p> <p>18 There's other processes that are occurring.</p> <p>19 Q A one million-acre watershed with multiple</p> <p>20 land uses and urbanization like the IRW is a very</p> <p>21 complex thing to predict; isn't that true?</p> <p>22 A I'm not sure what you're -- that's</p> <p>23 somewhat of a general statement. If you could</p> <p>24 please --</p> <p>25 Q And it's intended to be a general</p> <p style="text-align: center;">109</p>

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1 soil tests phosphorus than is used at the University  
2 of Arkansas' Soils Lab, therefore, the numbers are  
3 not equivalent?

4 A Correct.

5 Q So if I were to go take a soil sample from  
6 anywhere, split it in two, send half to Oklahoma  
7 State and half to the University of Arkansas, I  
8 would get different soil test phosphorus results;  
9 right?

10 A Correct.

11 Q Okay. And what you're describing here in  
12 your report is that there has been an equation  
13 developed to try to equate the Oklahoma -- an  
14 Oklahoma STP to an Arkansas STP; right?

15 A Correct.

16 Q Now, if you look at this equation with me,  
17 I want to make sure I'm reading it correctly here,  
18 where it says the ICAP Mehlich III P (1:10), on that  
19 side of the equal sign, is that the Oklahoma STP?

20 A Yes.

21 Q Okay. And everything to the right of the  
22 equal sign is the Arkansas STP; right?

23 A Correct.

24 Q Okay. So if I want to take an Oklahoman  
25 number and convert it to be equivalent to an

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1 Arkansas number, I take the --

2 A Left side.

3 Q Take the -- well, tell me how I would use  
4 this equation to do that.

5 A Right.

6 Q It's better for you to explain it than me  
7 explain it and you tell me I'm wrong.

8 A Okay. What you do is take the ICAP  
9 Mehlich III P (1:10), subtract 14.9 and divide that  
10 entire quantity by 1.27.

11 Q Okay. When -- now, let me ask you to  
12 repeat that and use the words the "OSU STP" and  
13 "Arkansas STP" so the record will be clear. Will  
14 you go through it again?

15 A Okay. You would take the OSU Mehlich III,  
16 subtract 14.9 and divide it by 1.27, and that would  
17 equal the Arkansas Mehlich III.

18 Q All right.

19 A Now, keep in mind here, though, that I  
20 believe it was 2006, the University of Arkansas  
21 switched over to the same method, at least dilution  
22 method, as Oklahoma State University. All right?  
23 So, from 2006 on, they both use that 1:10. They  
24 both still use different instruments for measuring  
25 the P, and that would be the other equation. So the

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1 first equation here, the conversions are only  
2 necessary, I believe it's up through 2005.

3 Q All right. From 2006 through the current  
4 methods, what is the appropriate method for  
5 converting one to the other?

6 A All right. Then it's the equation on  
7 Page 13 at the top of the page, and that particular  
8 one you would have the Oklahoma State University  
9 Mehlich III minus 26.7, divided by 1.11, and that  
10 would equal to -- I did it the other way around.  
11 Scratch that.

12 That equation is written to already  
13 predict the University of Arkansas. So the  
14 University of Arkansas Mehlich III would be equal to  
15 1.1 times the OSU Mehlich III plus 26.7.

16 Q Okay. So the color -- the Colormetric  
17 Mehlich III, that is OSU?

18 A Yes.

19 Q Is that what you're saying in that  
20 equation?

21 A Correct. So, in other words, the Arkansas  
22 Mehlich III is going to have a higher value than the  
23 OSU value.

24 Q On the same soil sample?

25 A Same soil sample.

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1 Q Okay. Now, in your modeling work you did  
2 here, how did you normalize the data? Did you use  
3 it expressed as all an OSU STP units?

4 A Yes, sir.

5 Q Okay. So you took all the Arkansas  
6 numbers, ran the conversions, converted them to an  
7 OSU number, and used them in your model; right?

8 A Correct.

9 Q Why was it important for you to do that,  
10 go through that exercise?

11 A Well, just so you're comparing apples to  
12 apples.

13 Q All right. Let's turn to the next page,  
14 Page 13.

15 You have a discussion about the  
16 information you input as far as poultry related to  
17 poultry houses or poultry production. In your  
18 updated -- or in the revision of your model that  
19 you're working on, are you changing any of the input  
20 information as far as the number of active poultry  
21 houses in the watershed?

22 A I don't recall if we were able to update  
23 those active versus inactive numbers or not. I  
24 would have to go and doublecheck.

25 Q Have you received any information that

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<p>1 came out of this lawsuit, such as discovery 2 responses from any of the defendants, identifying 3 numbers of active poultry houses? Have you received 4 any of that from anywhere?</p> <p>5 A No, I haven't. I did, though -- that was 6 the other thing I think I talked to Bernie yesterday 7 on. We did look at active versus inactive houses, 8 and I believe that Dr. Engel's numbers were very 9 similar. I think we used 71 percent and I think he 10 used 70 percent. But we did not obtain any of the 11 discovery data to come up with that 71 percent. And 12 again, I don't recall -- I don't believe we have 13 updated that 71 percent on the new version, but I 14 would have to doublecheck.</p> <p>15 Q Have you received any information provided 16 by the defendants in this lawsuit, of any kind, for 17 your use?</p> <p>18 A We received the water quality data from 19 the Attorney General's office where they sampled the 20 different watersheds for phosphorus, the stream 21 samples. I'm trying to think if there's anything 22 else besides that.</p> <p>23 Yeah, I think that's it. I don't think we 24 received anything beyond that.</p> <p>25 Q All right. Down to "Litter Production,"</p> <p style="text-align: center;">134</p>	<p>1 in the Eucha/Spavinaw watershed; right?</p> <p>2 A Correct.</p> <p>3 Q So when you say "We assume that litter was 4 applied to pastures in close proximity," can you put 5 a finer point on that? What does "close proximity" 6 mean?</p> <p>7 A So what we did was we took the 8 relationship on Page 16, Figure 3.2, and 9 determined -- yeah. And we -- let me see if I can 10 remember how we did this. But we assumed that 11 litter was applied closer to the poultry houses, and 12 the further away you got, there was less chance of 13 poultry litter being applied, and so we -- I don't 14 believe we did a uniform litter application. It 15 varied relative to distance from poultry houses.</p> <p>16 Let me check. I may be mixing up the two 17 studies.</p> <p>18 Q Can you put this in a little more context? 19 Can you say your -- what you determined in the Eucha 20 watershed, that X percentage of the litter is 21 applied within a certain distance of a poultry 22 house?</p> <p>23 A I'm sorry. Pardon me?</p> <p>24 Q If you're called to testify in the trial 25 of this matter --</p> <p style="text-align: center;">136</p>
<p>1 you state that you -- if I understand it correct, 2 that the litter volume or litter production input 3 you're using in the model, you do not -- you assume 4 there's no export of the poultry litter that's 5 generated in the Illinois River watershed; is that 6 right?</p> <p>7 A That's correct.</p> <p>8 Q In the update of your model, will that 9 continue as your assumption?</p> <p>10 A Yes.</p> <p>11 Q Now, this pasture litter application 12 discussion that begins on Page 13, you state that 13 "We know where litter is produced, i.e., a poultry 14 house"; right?</p> <p>15 A Uh-huh.</p> <p>16 Q "But not where it's applied"?</p> <p>17 A Correct.</p> <p>18 Q Is that still the case?</p> <p>19 A Yes.</p> <p>20 Q Your statement continues, "We assume that 21 litter was applied to pastures in close proximity to 22 the point of production"; right?</p> <p>23 A Correct.</p> <p>24 Q And if I have followed your discussion, 25 that is using this relationship that you developed</p> <p style="text-align: center;">135</p>	<p>1 A Uh-huh.</p> <p>2 Q -- and you take the stand and you make the 3 statement that you determined that litter was 4 applied to pastures in close proximity to the point 5 of production, I would like to know quantitatively 6 what that means.</p> <p>7 A Okay. So that means that we applied three 8 tons per acre -- we assumed that fields would 9 receive three tons per acre every other year, and 10 fields closest to the poultry houses would receive 11 that three tons per acre.</p> <p>12 And, then, as you move further out from 13 that house, assuming that there was still litter -- 14 kind of think of a bucket full of litter, all right, 15 and that's how much litter is produced in the basin 16 in a given year, and so the fields closest to those 17 poultry houses would receive three tons per acre 18 every other year.</p> <p>19 If there was still litter left in this 20 bucket, we moved out further away from the houses, 21 and then those fields would receive litter. If 22 there was still litter left in the bucket, we would 23 then move out from another ring. And then you get 24 to a certain point, if there wasn't any litter left 25 in our bucket, then they didn't receive poultry</p> <p style="text-align: center;">137</p>

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<p>1 litter. So we applied poultry litter close to the</p> <p>2 house and as far out as we could as long as there</p> <p>3 was available litter.</p> <p>4 <b>Q Okay. I understand the conceptual model</b></p> <p>5 <b>you're describing, but what does that translate to</b></p> <p>6 <b>as far as -- for instance, can you state that, based</b></p> <p>7 <b>on work that we did in the Eucha/Spavinaw watershed</b></p> <p>8 <b>which you believe X percent of litter is land</b></p> <p>9 <b>applied within X distance of a house --</b></p> <p>10 A Yes. That's the assumption that we're</p> <p>11 making based on those data. I mean, it's based upon</p> <p>12 collected data in Eucha/Spavinaw, though.</p> <p>13 <b>Q Okay. Fill in the blanks.</b></p> <p>14 A I'm sorry, if I'm not --</p> <p>15 <b>Q Blank percentage of litter is land applied</b></p> <p>16 <b>within blank miles of the poultry house? Can you</b></p> <p>17 <b>answer that?</b></p> <p>18 A Well, if you look at the relationship.</p> <p>19 Let's see. I think we made some assumptions here.</p> <p>20 In our study, we assumed it was not</p> <p>21 transported more than five kilometers from a house.</p> <p>22 That was the assumption that we made.</p> <p>23 <b>Q And what was the basis for the assumption?</b></p> <p>24 A The data collected from Eucha/Spavinaw.</p> <p>25 So, in other words, if there was not a dramatic</p> <p style="text-align: center;">138</p>	<p>1 A That's just based on our own personal</p> <p>2 observations, correct.</p> <p>3 <b>Q Do you believe that to be true in the</b></p> <p>4 <b>Illinois River watershed?</b></p> <p>5 A I would expect some hay fields to receive</p> <p>6 litter and some not to. I think it's kind of -- it</p> <p>7 would be a combination of both.</p> <p>8 <b>Q Okay. The -- let's go to the next</b></p> <p>9 <b>paragraph.</b></p> <p>10 <b>This assumption used with a rate, litter</b></p> <p>11 <b>application rate of three tons per acre every other</b></p> <p>12 <b>year, what was the basis behind that?</b></p> <p>13 A Well, it's difficult to accurately put</p> <p>14 down, you know, less than a couple of tons per acre</p> <p>15 per year, just physically taking the trucks out and</p> <p>16 getting a nice uniform application. It's much</p> <p>17 easier to go out and apply three tons per acre.</p> <p>18 And so -- and that I believe was some of</p> <p>19 the -- based on some of the information that we got</p> <p>20 from some of the local cooperative extension and</p> <p>21 conservation district people, that that was not an</p> <p>22 uncommon practice to actually apply every other year</p> <p>23 at higher rates.</p> <p>24 And relative to the way the model</p> <p>25 responded, I mean, it -- we would have had very</p> <p style="text-align: center;">140</p>
<p>1 increase in soil test phosphorus, we assumed that</p> <p>2 those fields are not receiving litter.</p> <p>3 <b>Q Okay. All right. Well, let's move on.</b></p> <p>4 <b>On Page 14, your discussion continues.</b></p> <p>5 A Uh-huh.</p> <p>6 <b>Q And at the end of that first paragraph,</b></p> <p>7 <b>you make the statement, "Well-managed pastures were</b></p> <p>8 <b>more likely to receive litter than either hay fields</b></p> <p>9 <b>or poorly-managed pastures."</b></p> <p>10 <b>First, explain to me what you mean that a</b></p> <p>11 <b>hay field was less likely to receive litter.</b></p> <p>12 <b>Explain that to me.</b></p> <p>13 A All right. So when we were looking --</p> <p>14 when we looked at the land cover data and the data</p> <p>15 that was used to develop that land cover, if the</p> <p>16 fields had significant biomass, meaning lots of</p> <p>17 grass and all, we assume that the quantity of grass</p> <p>18 was a result of fertilization, and those fields that</p> <p>19 had minimal biomass and were -- looked like</p> <p>20 parentally overgrazed, we assumed that they probably</p> <p>21 likely did not receive fertilizer.</p> <p>22 <b>Q Are you saying that the information you</b></p> <p>23 <b>collected suggests to you that hay fields are less</b></p> <p>24 <b>likely to receive poultry litter than a well-managed</b></p> <p>25 <b>grazed pasture?</b></p> <p style="text-align: center;">139</p>	<p>1 similar results, whether we had .75 ton per acre per</p> <p>2 year or -- I mean one and a half every year or three</p> <p>3 ton per acre.</p> <p>4 <b>Q Speaking of the real world, you --</b></p> <p>5 A Uh-huh.</p> <p>6 <b>Q Under -- as we sit today, do you agree</b></p> <p>7 <b>that everyone who land applies poultry litter in the</b></p> <p>8 <b>Illinois River watershed, either by Arkansas law or</b></p> <p>9 <b>Oklahoma law, is going to have a dictated maximum</b></p> <p>10 <b>land application rate?</b></p> <p>11 MR. NANCE: Object to the form.</p> <p>12 BY MR. McDANIEL:</p> <p>13 <b>Q Under the statute or a nutrient management</b></p> <p>14 <b>plan written under the statutes?</b></p> <p>15 MR. NANCE: Object to the form.</p> <p>16 Go ahead.</p> <p>17 THE WITNESS: Well, there are -- if you</p> <p>18 follow the Oklahoma 590, there are rates associated</p> <p>19 with that, and I believe the new regs over in</p> <p>20 Arkansas have some rates in there as well. I don't</p> <p>21 recall offhand the specifics of those various regs,</p> <p>22 though. I'd have to review that.</p> <p>23 BY MR. McDANIEL:</p> <p>24 <b>Q Okay. Let's back up to the question I</b></p> <p>25 <b>asked.</b></p> <p style="text-align: center;">141</p>



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<p>1 obviously. I was looking at the .037 milligram per 2 liter standard, which was a monthly geometric mean, 3 which means there were numbers that had to go in 4 versus one number for a monthly geometric mean, so 5 it was important that we looked at the daily time 6 step. So with that small temporal distribution, it 7 was really important that we account for those 8 in-stream processes. We weren't looking at average, 9 annual long-term loading. We were looking at a 10 daily concentration.</p> <p>11 <b>Q What four water quality stations did you</b> 12 <b>use in your calibration process as part of your 2006</b> 13 <b>work for ODEQ?</b></p> <p>14 A Yeah, I'll pull that up again. That was 15 mentioned earlier. Let me make sure I get it right. 16 So we had Flint Creek near Kansas, 17 Oklahoma -- no, wait a minute. That was not -- that 18 was not used in the calibration. Excuse me. 19 Illinois River near Watts, Oklahoma; 20 Illinois River at Chewey, Oklahoma; Illinois River 21 near Tahlequah, Oklahoma; and Baron Fork at Eldon.</p> <p>22 <b>Q And I'm looking at Figure 6.2. Is that</b> 23 <b>what you were just looking at as well?</b></p> <p>24 A 6.1.</p> <p>25 <b>Q Okay. And it appears to me that your</b></p> <p style="text-align: center;">222</p>	<p>1 Baron Fork, Watts, or Kansas, and simply calibrated 2 on Tahlequah station only, I mean, we -- it's 3 possible we would have gotten very similar results. 4 But when you can incorporate that additional data, 5 it should help to minimize or reduce, I should say, 6 the uncertainty in your predictions.</p> <p>7 <b>Q So, as a general matter, in your modeling</b> 8 <b>work, you have found, if I understand you correctly,</b> 9 <b>the more stations you have available and you could</b> 10 <b>use in a calibration, the less uncertainty you find</b> 11 <b>in the results of your modeling work; is that right?</b></p> <p>12 A Theoretically, it should reduce the 13 uncertainty.</p> <p>14 <b>Q Do you know with respect to Dr. Engel's</b> 15 <b>application of GLEAMS in this case, how many</b> 16 <b>calibration stations he used? Do you recall?</b></p> <p>17 A I don't recall what he used in there.</p> <p>18 <b>Q Now, you said earlier that the GLEAMS</b> 19 <b>model used by Dr. Engel did not account directly for</b> 20 <b>cattle defecating on the surface of the soil.</b> 21 <b>Do you recall that?</b></p> <p>22 A On the upland areas.</p> <p>23 <b>Q Okay. On the upland areas?</b></p> <p>24 A Yes.</p> <p>25 <b>Q But that he accounted for it indirectly</b></p> <p style="text-align: center;">224</p>
<p>1 <b>water quality stations that you use in your</b> 2 <b>calibration are to some extent distributed both in</b> 3 <b>the upland portions of the watershed and in the</b> 4 <b>downstream portions; is that right?</b></p> <p>5 A Yes.</p> <p>6 <b>Q And is that important in calibration to</b> 7 <b>have a distribution of water quality stations that</b> 8 <b>you're using data from as part of your calibration?</b></p> <p>9 A It depends upon -- back to that whole 10 objective, right, what you're -- what will you be 11 using the model predictions for. All right? So if 12 you're just looking at, say, a total loading going 13 into Tenkiller, and you're allocating source -- even 14 allocating sources within the watershed of what's 15 going into Tenkiller, that may not necessarily be 16 important to include some of those other stations.</p> <p>17 In our application, again, when we were 18 looking at a very small time increment in terms of 19 daily, all right, it's important to look at 20 dissolved in particulate, then the more stations we 21 can include along a particular river segment, the 22 better.</p> <p>23 So, in other words, more detailed 24 information you need, the more data that you try to 25 incorporate. It doesn't mean that if we had ignored</p> <p style="text-align: center;">223</p>	<p>1 <b>when he turned the knobs as part of the calibration</b> 2 <b>process. Do you recall saying that?</b></p> <p>3 A Yes, sir.</p> <p>4 <b>Q Help me understand. I don't understand</b> 5 <b>what you mean by "turn the knobs."</b></p> <p>6 A Uh-huh.</p> <p>7 Through the calibration process, there is 8 a number of different parameters that you can 9 adjust. We have initial estimates for those 10 parameters, but the uncertainty associated with 11 those parameters actually should be -- I mean, 12 there's actually a range that they can be. And so 13 what you do is adjust those parameters until the 14 model predicts and matches reasonably well to the 15 observed data.</p> <p>16 So even though he may not have accounted 17 for directly the actual process of defecation from 18 the cows on the surface, that would have been 19 indirectly accounted for by twisting the knobs a 20 little more one way, because, you know, cattle 21 defecating on the surface actually kind of -- what 22 you're doing is you're pulling up phosphorus out of 23 the soil, running it through the cow, and then 24 depositing it back on the surface, and that 25 increases the potential and availability for that</p> <p style="text-align: center;">225</p>

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<p>1 phosphorus to move the surface runoff into the</p> <p>2 creek. So you're basically increasing the</p> <p>3 efficiency of transport from the field to the creek</p> <p>4 itself.</p> <p>5 <b>Q There's not a cattle knob on GLEAMS that</b></p> <p>6 <b>you turn to account for cattle?</b></p> <p>7 A I don't believe there is.</p> <p>8 <b>Q Okay. And when you say that you accounted</b></p> <p>9 <b>for it in the calibration process, were you using</b></p> <p>10 <b>"accounted for" in a quantitative sense; in other</b></p> <p>11 <b>words, that he could quantify the amount of</b></p> <p>12 <b>phosphorus coming from the defecation by cattle in</b></p> <p>13 <b>the watershed through his calibration process?</b></p> <p>14 A He wouldn't be able to quantify the</p> <p>15 fraction of that load resulting from the cow</p> <p>16 defecating on the upland areas. All right? That</p> <p>17 would be lumped together with the other sources.</p> <p>18 <b>Q Okay. So let me back up then.</b></p> <p>19 <b>Did Dr. Engel, based on your review of his</b></p> <p>20 <b>work, do anything to actually quantify with GLEAMS</b></p> <p>21 <b>the amount of phosphorus that is delivered to a</b></p> <p>22 <b>stream or to Lake Tenkiller as a result of cattle?</b></p> <p>23 A Yes. That was accounted for in the GLEAMS</p> <p>24 model, again, through the calibration process. So</p> <p>25 the answer to that is "yes."</p> <p style="text-align: center;">226</p>	<p>1 streams, but I don't believe he accounted for a</p> <p>2 particular fraction from the upland contribution.</p> <p>3 <b>Q And did he account for cattle in or near</b></p> <p>4 <b>the streams in GLEAMS or outside of GLEAMS?</b></p> <p>5 A Outside.</p> <p>6 <b>Q Let's stay with GLEAMS for a moment.</b></p> <p>7 <b>With respect to his application of GLEAMS</b></p> <p>8 <b>in this case, did Dr. Engel do anything that would</b></p> <p>9 <b>allow him to account for, in terms of relative</b></p> <p>10 <b>contribution, the amount of phosphorus delivered to</b></p> <p>11 <b>the streams or to Lake Tenkiller from cattle?</b></p> <p>12 A What I'm trying to think is if there's a</p> <p>13 way that you could approximate that based on those</p> <p>14 model runs.</p> <p>15 <b>Q Well, my question really is: Did</b></p> <p>16 <b>Dr. Engel approximate it?</b></p> <p>17 A Oh, Dr. Engel didn't, no. I thought you</p> <p>18 were asking whether or not he could.</p> <p>19 <b>Q No. Whether or not he did.</b></p> <p>20 A And again, if it was -- he may have</p> <p>21 accounted for that, then I just didn't see it, also,</p> <p>22 but I don't recall seeing it.</p> <p>23 <b>Q Now, let's talk -- let's stay with</b></p> <p>24 <b>Dr. Engel's report for a moment.</b></p> <p>25 <b>You told Mr. Elrod that you reviewed</b></p> <p style="text-align: center;">228</p>
<p>1 <b>Q When I use the word "accounted for," I</b></p> <p>2 <b>mean in a quantitative sense.</b></p> <p>3 <b>Do you understand that?</b></p> <p>4 A Again, I think you're -- this is semantics</p> <p>5 here, but it's really important that it's stated</p> <p>6 properly. I'm trying to think of another way to</p> <p>7 explain it.</p> <p>8 Simply because there is not a cattle</p> <p>9 component in the GLEAMS model does not mean that he</p> <p>10 did not quantitatively account for the effect of</p> <p>11 that in the -- through the calibration process.</p> <p>12 <b>Q Let me approach it this way. I think I</b></p> <p>13 <b>understand what the confusion is. I'll take a run</b></p> <p>14 <b>at it. If not, we'll try it again.</b></p> <p>15 A Okay.</p> <p>16 <b>Q You understand in Dr. Engel's report that</b></p> <p>17 <b>he reports a relative contribution for poultry</b></p> <p>18 <b>litter to the overall phosphorus level in the</b></p> <p>19 <b>watershed? Do you understand that?</b></p> <p>20 A Yes.</p> <p>21 <b>Q Okay. Did Dr. Engel do anything in his</b></p> <p>22 <b>application of GLEAMS in this case to allow him to</b></p> <p>23 <b>similarly express a relative contribution of cattle</b></p> <p>24 <b>to the overall phosphorus load in the watershed?</b></p> <p>25 A He accounted for the cattle in or near the</p> <p style="text-align: center;">227</p>	<p>1 <b>Dr. Engel's report and that you spoke with Dr. Engel</b></p> <p>2 <b>prior to giving your deposition today; is that</b></p> <p>3 <b>correct?</b></p> <p>4 A Yes. Uh-huh.</p> <p>5 <b>Q Did you write any portion of Dr. Engel's</b></p> <p>6 <b>report?</b></p> <p>7 A No. No.</p> <p>8 <b>Q Did you, Dr. Storm, collaborate with him</b></p> <p>9 <b>in any way in the preparation of his report or the</b></p> <p>10 <b>formation of his opinions that he's expressing in</b></p> <p>11 <b>this case?</b></p> <p>12 A Well, I'm certain that I, through our</p> <p>13 interaction, through some of the other litigation</p> <p>14 and through interaction on a professional level, or</p> <p>15 maybe even -- maybe even as it relates to this case.</p> <p>16 I mean, we've had discussions and I have provided</p> <p>17 Dr. Engel with, you know, background in terms of the</p> <p>18 basin itself, you know, activities that are going on</p> <p>19 in that basin, some of the issues associated with</p> <p>20 some of the water quality, so I'm sure at some time</p> <p>21 or other, I have conveyed some of my own experiences</p> <p>22 and knowledge of that basin to him. I'm sure I must</p> <p>23 have at some point in time.</p> <p>24 <b>Q I had something a little more professional</b></p> <p>25 <b>in mind in terms of collaboration than just</b></p> <p style="text-align: center;">229</p>